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RE: WORKSHOP 2 (Oct. 1, 2013)

VALUE OF SOLAR

SunEdison appreciates the opportunity to provide comments in response to the Department of Commerce Energy Division's ("DER") request for comments on the material presented at the October 1, 2013 *Value of Solar Tariff Methodology Development* workshop ("Workshop 2"). The stakeholder process developed and facilitated by DER has provided a transparent, focused, and educated forum to evaluate the value distributed solar generating ("DSG") resources bring to the utility system and we applaud DER for their leadership.

COMPANY BACKGROUND

SunEdison is a 55-year old company headquartered in Belmont, California that specializes in global manufacturing of polysilicon and silicon wafers used in the application of the SunEdison Solar modules as well as semiconductors for the electronics industry. Further, SunEdison is the second largest solar developer in the world, with over 1.3 GW of solar under management worldwide and another 2.3 GW under development. SunEdison designs, builds, manufactures, develops, finances, installs, operates and manages solar plants ranging from residential and commercial rooftop systems to large utility-scale facilities.

As a leading solar developer in both the distributed generation and utility scale fields, it is SunEdison's goal to bring near *and* long-term economic development opportunities to Minnesota in a cost-effective way that enables compliance with the Solar Energy Standard ("SES"), diversifies resource portfolio risk, and enhances generation and distribution reliability.

SUMMARY OF SUGGESTIONS

There has been increased utility attention towards the "buy-all, sell-all" settlement mechanism for DSG resource production. Some view it as a rate-design solution to address cross-subsidization resulting from net-metering ("NEM"). The exploration of the "buy-all, sell-all" settlement mechanism is the result of a paradigm shift within the electric utility industry that is experiencing increases in customer adoption of de-centralized generation (such as renewables and standby) and energy efficiency.

SunEdison's comments within this document relate specifically to the derivation of *what is paid*, not *how it is paid*. Therefore SunEdison has not commented on the actual "buy-all, sell-all" settlement mechanism and instead has only focused on what and how much it is paid for DSG attributes.

SunEdison is supportive of the value components identified by CPR, with additional considerations beyond CPR's suggestions on assumptions used to calculate the economic savings. With respect to estimating an appropriate proxy for what DSG resources should be paid, and as discussed during DER's first workshop, many national studies have been performed that provide guidance on the basic value streams and the origination of these values for DSG. The work presented by Clean Power Research ("CPR" or the "Consultant") in Workshop 2 appears to be aligned with best practices noted in the credible studies presented in Workshop 1.

In summary, SunEdison provides DER with the following suggestions related to material discussed during the October 1, 2013 stakeholder workshop:

1. As a fuel-free resource, DSG provides Minnesota ratepayers a hedge against volatile market purchases, *and* insurance against increased utility rates over the life of the DSG asset---both of which should be monetized
2. When possible, actual DSG fleet production data should be synched with actual system load data for the same hours modeled, and not rely only on TMY[1], Meteonorm[2], or any other form of meteorological data used to model the weather and therefore estimate subsequent PV generation
3. An appropriate contract term and period to levelized costs and benefits over is twenty-five years
4. Consideration of a "solar market-proxy" for avoided energy and avoided capacity costs rather than the marginal cost of a CCGT when there are outstanding SES compliance requirements
5. Different VoS calculations should be conducted for distributed, behind-the-meter installations and central, community solar projects connected directly to the distribution system because they have different resource attributes that result in different resource values
6. At this point in the stakeholder process, a reasonable estimate for value components can be found in national DSG studies discussed in Workshop 1: SunEdison will provide more substantive feedback once the model is initially run based on the set broad assumption parameters identified in Workshop 2 and discussed herein
7. Special attention should be given to discount rates and their relationship with avoided capital costs and the reduction in fuel price uncertainty
8. Transparency, simplicity, and standardization are fundamental to the derivation of VoS and the implementation of the associated utility tariff and program

[1] Typical meteorological year (TMY) is a collation of selected weather data for a specific location, generated from a data bank much longer than a year in duration. It is specially selected so that it presents the range of weather phenomena for the location in question, while still giving annual averages that are consistent with the long-term averages for the location in question. TMY3 data takes the average from 1976 to 2009, whereas TMY2 data takes the average from 1961 to 1991.

VALUE OF SOLAR: MACRO TRANSACTION

When developing VoS and the associated program and tariff, it's important to remember what transaction the VoS calculation is trying to capture. VoS is capturing the value of the solar generation to the utility (the purchaser of the power) and results in utility indifference as to whether they get energy/capacity from DSG or the unit on the margin (CCGT). Essentially, VoS is the market pricing signal for distributed solar generators the same way locational marginal pricing ("LMP") is the signal for wholesale market generators. In many markets, net-metering serves as the LMP-equivalent for the DSG market. At the end of the day, the VoS *rate* is calculated to ensure the utility is paying a fair and reasonable price for the export from the DSG resource, and the VoS *tariff* is designed to ensure the customer still pays for the value of the services they import. Together, the rate and tariff help ensure the customer is fairly compensated for their generation, and that the utility is indifferent to it being distributed or central-station generation.

Because Workshop 2 examined (a) components and (b) their basis for cost assumptions, SunEdison has only provided feedback on these topics which constitute the derivation of the rate. SunEdison has concerns around the tariff design, including the net-billing structure, but will reserve them for future DER workshops.

VALUE OF SOLAR: GENERAL PARAMETERS

Generally, SunEdison believes that comments on estimates for the value streams are premature at this top. As DER has already noted, the first priority is the model and assumptions through the stakeholder process. SunEdison agrees: if the model and the assumptions are right, then the values will be what they will be. Because Workshop 2 was focused on refining the value streams and the associated savings basis (assumptions), it is our suggestion that following consensus on assumptions, Workshop 3 provide a "first-run" of Minnesota-specific numbers to determine a starting-point for model refinement. For rough estimation purposes, a proxy for the VoS rate would be an in-state solar Power Purchase Agreement that the utility entered into through the wholesale market that is trued-up for DSG-specific benefits. SunEdison estimates this to be in the range of $0.11-$0.15 per kilowatt hour ("kWh").

Parameters for the Model

Energy-Based Payment

SunEdison agrees with CPR's position that VoS transaction is capturing the economic value of the DSG delivered to the utility. The energy payment ($/kWh) also should capture loss-savings at the point of injection.

Current Penetration

SunEdison agrees with CPR's position that it is appropriate to model DSG value to the utility based on today's resource portfolio needs and that the annual re-calculations take into account the changing portfolio landscape.

Onsite Generation vs. Central Station Community Solar Generation

SunEdison strongly encourages DER to generate two classes of VoS calculations: one for behind-the-meter distributed generation, and one for central-station community solar generation ("CSG"). SunEdison believes that while many of the value components may be the same, there are inherent differences between centrally-located CSG resources and DSG resources therefore two different models with different assumptions should be developed. For example, typical behind the meter installations are located on rooftops and provide energy at the point of consumption, while CSG will mitigate distribution line losses across the system

Integration Costs Should Be Acknowledged, Too

When developing the VoS rate, SunEdison recognizes solar is a non-firm resource. As such, the utility may incur integration fees and SunEdison encourage this to be part of the discussion. However, similar to CPR's position on taking current penetration for the full contract term when recalculating VoS annually, SunEdison does not believe DSG penetration in Minnesota has reached a critical threshold where the utility is incurring unreasonable additional costs. Many national studies examined in Workshop 1 explore the relationship between increased integration costs and increased DSG penetration and demonstrate the threshold at which it may be appropriate to assess costs.

Parameters for the Inputs

Fleet Approach

In general, SunEdison is supportive of CPR's suggestion to take a fleet approach when modeling the DSG value. From a resource planning standpoint, this is consistent with how the utility manages their current resource portfolio efforts. Further, Berkley Lab found that "the relative aggregate variability of 100 PV plants sited in a dense 10 x 10 array with 20 km spacing between plants is 6 times less than the variability of a single site on time scales of less."[2] When utilities integrate them into the distribution management system or central operations, they are typically viewed from a "fleet" approach.

Consistent with Resource Planning Assumptions

[2] http://emp.lbl.gov/sites/all/files/REPORT%20lbnl-3884e.pdf

SunEdison would like to highlight the need to maintain consistent assumptions with the utility's integrated resource planning efforts when modeling DSG savings. This includes assumptions relating to deferrable resources, periods of sufficiency and deficiency, market forecasts, capital costs and discount rates.

The need for alignment with Resource Planning efforts is highlighted in CPR's presentation of the misalignment between the DSG *assumed* resource fleet generation peak (from PVWatts modeling), and the actual managed utility system peak. Actual production data needs to be aligned with actual system data for the same point in time to determine the DSG fleet capacity value to the utility. Use of generic production data from PVWatts is a simplified tool to estimate system production. When possible, actual solar data should be used to create a comprehensive data set. If enough actual data isn't available, PVSYST provides the user greater flexibility in modeling system specific design parameters than PVWatts. For example, the type of module, the type of DC voltage collection, the type of inverter, as well as how each of the specific parameters interact with one another, will cause a varying degree of performance from system to system.

VoS is a new procurement mechanism for utility procurement of *distributed* resources. Even though this is a wholesale procurement tool by the utility, PURPA Qualified Facility ("QF") transactions are for the procurement of wholesale *central-station* resources. VoS has many of the same value components as a PURPA QF avoided cost calculation, however based on some key differences between QFs and VoS, VoS resources provide utilities with more savings than a QF based on point of interconnection. Some of these differences between a QF and VoS rate include legislative intent and capacity and energy savings.

DC:AC Derate

The DC:AC derate calculations presented by CPR in Workshop 2 need further clarification around what constitutes "other loss factors." A more appropriate DC:AC derate factor is estimated to be in the range of 77% to 85%. As an experienced developer, SunEdison typically sees performance ratios in the ~80% range depending on location and project specifics. In theory, the combination of losses noted by CPR would add up to a derate of this magnitude. If light-induced degradation, irradiance, and temp losses are accounted for in the "module derate factor," then it's likely in the right ballpark. Inverter efficiencies are higher than 95% today for big units (~98.5%) and then inclusion of "other loss factors" (to be provided, ~90%) can result in approximately an 80% performance ratio. So, with these estimates, total losses would be 0.9*0.985*0.9=~0.80 or 80% performance ratio. Additionally, other system innovations can lead to improvements in the DC to AC conversion that can push the performance ratio higher.

Consistent Term for Contract and Levelization

SunEdison agrees with CPR's recommendation to use twenty-five years as the contract and levelization term. While Statute only specifies a minimum of twenty years, we believe that twenty-five years reasonably reflects the useful life of a customer-sited DSG resource.

VALUE STREAMS AND BASIS FOR SAVINGS

SunEdison is supportive of the value streams presented by CPR and has feedback on the assumptions used to derive the savings associated with certain value streams. Additionally, SunEdison recommends DER and CPR continue modeling the "optional" value streams identified in the statute and leave it up to the utility and Public Utility Commission to decide whether or not a utility includes them in their adoption.

Optional Value Streams

SunEdison would like to highlight some considerations for monetizing optional value streams. When considering a credit for "high value distribution integration," it is important to consider how this might further differentiate a CSG VoS derivation. This mechanism can be used to designate where high-value CSG facilities should be cited which is a benefit to all ratepayers and unique to CSG-size resources.

"Credit for manufacturing and assembly" is an important value stream with similar economic development metrics associated with it as the "Made in Minnesota" incentive. If this is made mandatory, SunEdison believes it is important to ensure Xcel is given an equivalent incentive supported by the state or another funded entity, rather than directly by ratepayers.

Additional Considerations for Assumptions Used in Calculating the Basis for Savings

Marginal Unit

SunEdison encourages DER to evaluate the use of a "market proxy" as the next deferrable capacity and energy resources. The "market proxy" is a method used in calculating avoided costs when there is still an Integrated Resource Plan target or outstanding Renewable Energy Standard compliance obligations. As long as there exists an IRP or RES target, the next deferrable resource is actually a solar resource, rather than a marginal unit of gas. Once the IRP and RES obligations are fulfilled, then the deferrable resource reverts back to a marginal unit of gas, or whatever the marginal cost is of the generator acting on the margin (energy and capacity). Further, if the "market proxy" method is employed, that should satisfy the utilities' monetary obligation to meet the RPS and capture that value already identified in the Environmental Value Components.

Insurance Policy for Ratepayers Against Increased Utility Energy Rates

Frequently, renewable generation is described as providing a "hedge value" against the volatile fuel associated with traditional, non-renewable generators given that renewable generators have no fuel costs. Beyond just providing a hedge value, which is often based on a short-term financial product, solar provides a long-term insurance policy for ratepayers against any increase in utility rates. A hedge product is a financial product based on future market forecasts and locking-in a future financial derivative. An insurance product is really a "lifetime fixed utility energy rate" ratepayer insurance policy that reduces utility balance sheet risk exposure and should be valued similarly to how life insurance policies are valued. As such, SunEdison also believes that RMP should be eligible to receive regulatory approval for the cost-recovery of this "insurance policy" as it represents a true long-term value to ratepayers.

REC Valuation

A value for the Renewable Energy Credits should be clearly identified in concert with the development of any affiliated utility solar distributed solar programs they offer.

DSG Capacity Value

SunEdison recommends further discussion around the capacity value of DSG resources. As suggested by CPR, the ELCC methodology is appropriate and actual generation/load-synched data should be used when available. SolarAnywhere is an appropriate resource when actual data is not available. These resource values could be anywhere from an estimated 35% to 50+% capacity value.

OTHER THOUGHTS AND CONSIDERATIONS

Because the VoS rate is impacted by resource planning efforts, it should be noted that years when the utility undergoes major market or capital acquisitions on the market may be reflected in that year and subsequent years. Therefore, VoS will be more closely aligned with wholesale procurement trends.

To echo the sentiment of many stakeholders attending Workshop 2: transparency, simplicity and consistency are critical to the long-term viability of the VoS tariff offering. As such, SunEdison is supportive of efforts to simplify models, provide transparent data, standardize models and assumptions statewide as much as possible, and use consistent assumptions.

CONCLUSION

SunEdison appreciates the opportunity to provide feedback on DER's VoS efforts. DER has done an outstanding job facilitating the stakeholder process and identifying industry experts to share best practices in developing the rate and tariff construct. SunEdison suggests the assumptions be more thoroughly vetted by stakeholders to see if there is a place of consensus before having CPR run the model. Specifically, the consensus on the assumptions the parties would recommend for: capacity value, the value of hedge/insurance products and whether NYMEX is a reasonable basis, orientation-specific calculations, and Minnesota DSG capacity value. Once these assumptions are more thoroughly vetted in a stakeholder setting, the next most important step will be to test the assumptions, and see if the model generates a reasonable calculation based on IRP and solar benchmarks.

Sincerely,

Maura Yates

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